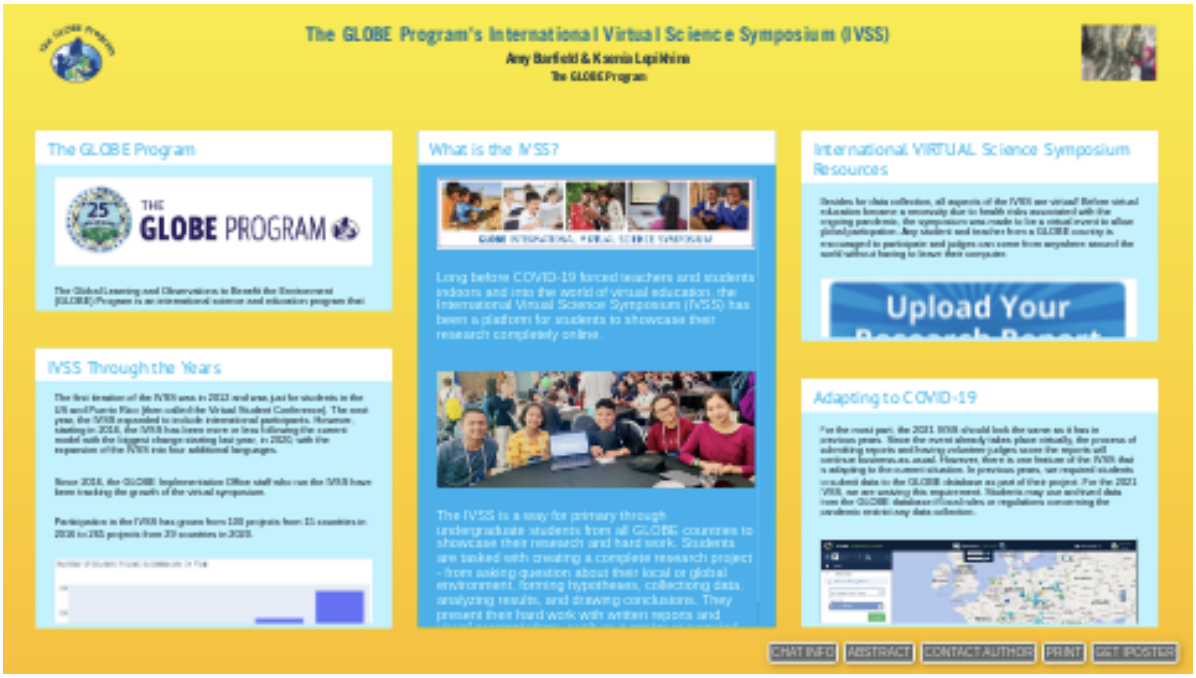
The GLOBE Program's International Virtual Science Symposium (IVSS)



Amy Barfield & Ksenia Lepikhina

The GLOBE Program

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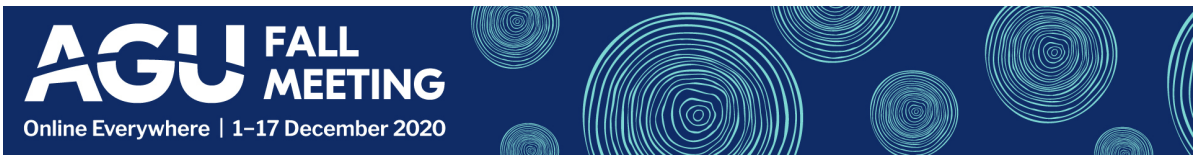


THE GLOBE PROGRAM

The Global Learning and Observations to Benefit the Environment (GLOBE) Program is an international science and education program that provides students and the public worldwide with the opportunity to participate in data collection and the scientific process, and contribute meaningfully to our understanding of the Earth system and global environment. Announced by the U.S. Government on Earth Day in 1994, GLOBE launched its worldwide implementation in 1995.

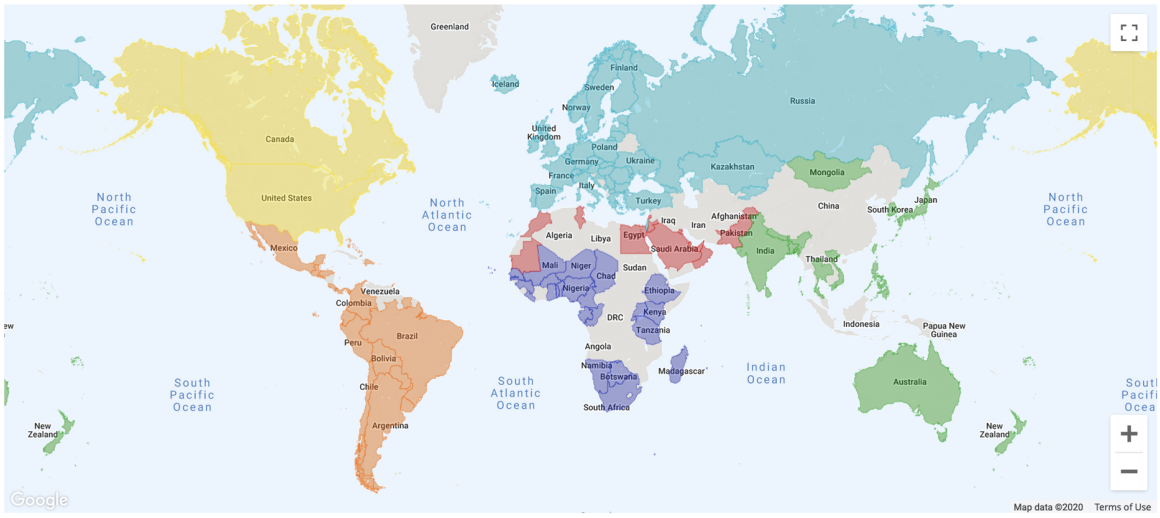
Vision: A worldwide community of students, teachers, scientists, and citizens working together to better understand, sustain, and improve Earth's environment at local, regional, and global scales.

Mission: To promote the teaching and learning of science, enhance environmental literacy and stewardship, and promote scientific discovery.

With GLOBE, students learn the practices of science through hands-on investigations in their own communities, sparking their curiosity and interest in science. This often leads to inquiries that help solve real-world problems and further understanding of our global environment.

[VIDEO] https://www.youtube.com/embed/KkvyhYiL-pE?rel=0&fs=1&modestbranding=1&rel=0&showinfo=0

GLOBE is in 123 countries which are divided into six regions: Africa, Asia and Pacific, Europe and Eurasia, Latin America and Caribbean, Near East and Norh Africa, and North America.



Africa	Asia and Pacific	Europe and Eurasia	Latin America and Caribbean	Near East and North Africa	North America
27 Countries	18 Countries	43 Countries	20 Countries	13 Countries	2 Countries

Screenshot of the GLOBE Members Map.

Sponsored by: NASA Supported by: NSF NOAA Implemented by: UCAR

IVSS THROUGH THE YEARS

The first iteration of the IVSS was in 2012 and was just for students in the US and Puerto Rico (then called the Virtual Student Conference). The next year, the IVSS expanded to include international participants. However, starting in 2016, the IVSS has been more or less following the current model with the biggest change starting last year, in 2020, with the expansion of the IVSS into four additional languages.

Since 2016, the GLOBE Implementation Office staff who run the IVSS have been tracking the growth of the virtual symposium.

Participation in the IVSS has grown from 100 projects from 15 countries in 2016 to 265 projects from 29 countries in 2020.

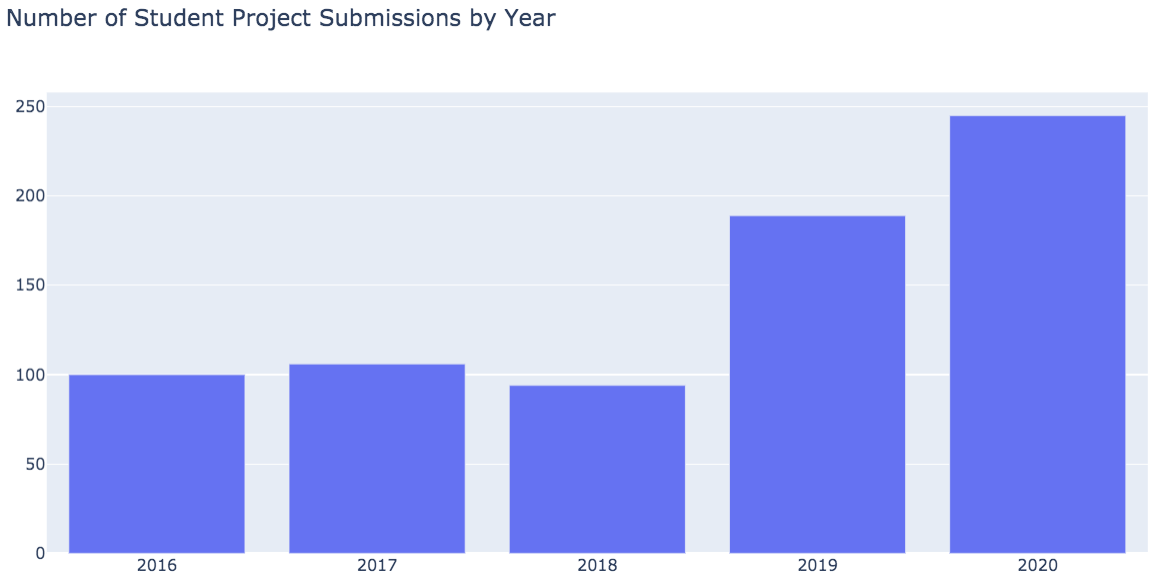


Figure 1: Number of Student Project Submissions by Year. Besides for 2018, the IVSS has seen a steady increase in the number of student projects submitted each year. The slight dip in 2018 is attributed to an earlier due date that was set that year in order to include IVSS students in the 2018 GLOBE Learning Experience. (Figure provided by Ksenia Lepikhina)

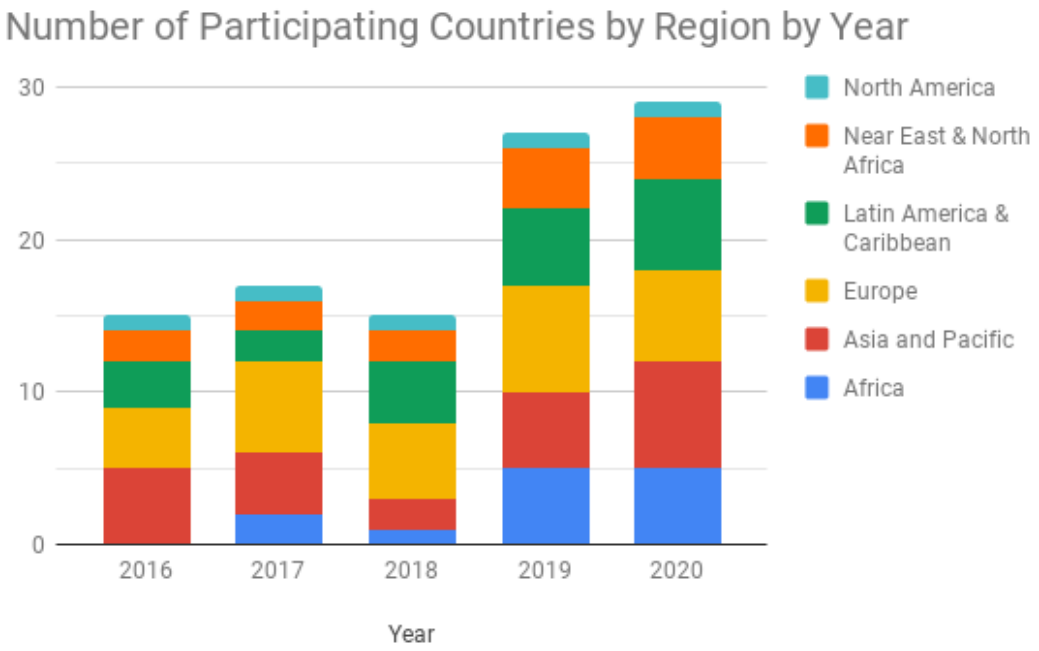


Figure 2: Stacked bar chart showing the number of participating countries by GLOBE region by year. The USA is the only participating country in the North American region and has participated every year. In the past two years, there is a marked increase in the number of countries who have participated in Africa and in the Asia and Pacific region.

Though we strive for growth every year, which includes receiving submissions from new schools and new countries, we are equally happy to see repeat participation.

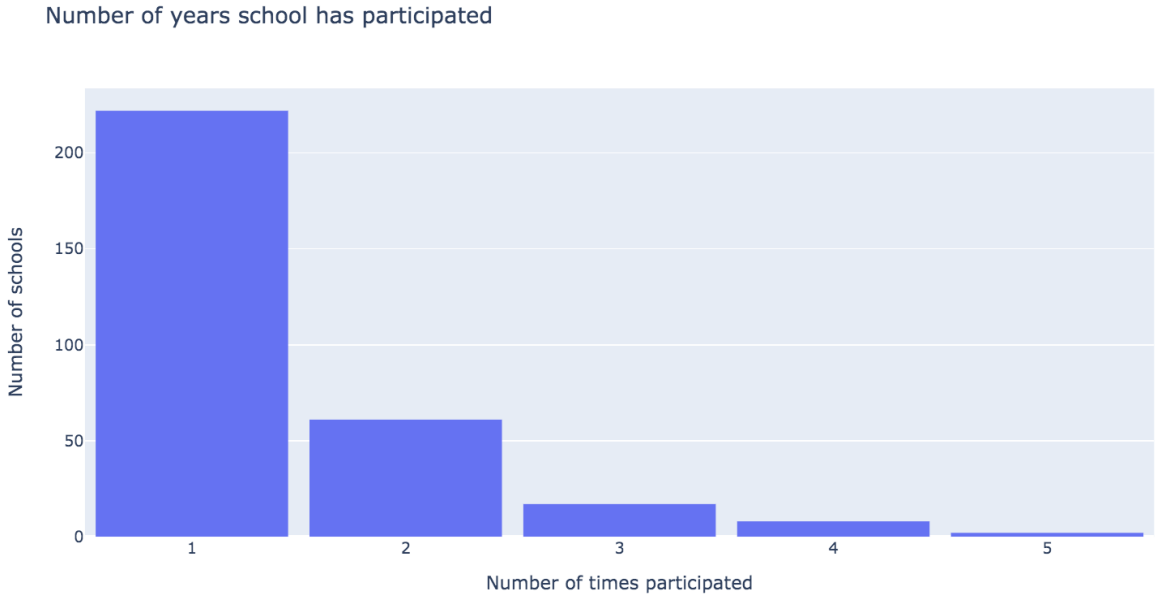


Figure 3: This bar chart is showing the number of schools who have submitted entries multiple years as of 2020. Most submissions are from schools participating for the first time, but we have had several schools submit multiple years and a few that have participated for the past five years! (Figure provided by Ksenia Lepikhina)

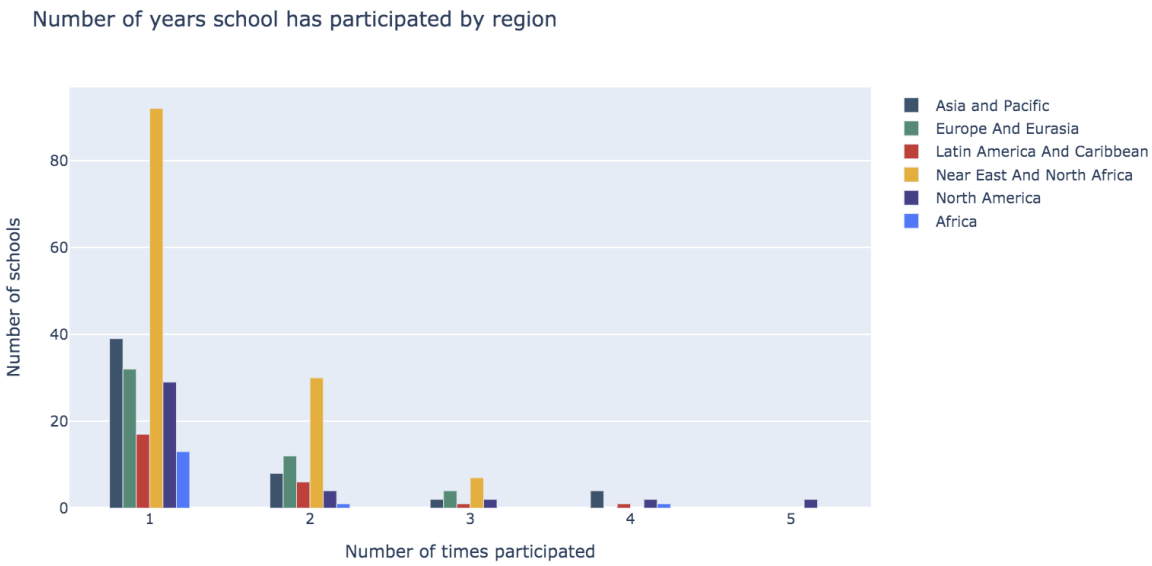


Figure 4: A bar chart showing the same data as Fig 3 but broken down by GLOBE region. (Figure provided by Ksenia Lepikhina)

We have seen repeat participation from judges as well.

Figure 5: This bar chart is showing the number of judges who have scored projects multiple years as of 2020. It is always positive to see judges return multiple years to volunteeer their time to score student projects. (Figure provided by Ksenia Lepikhina)

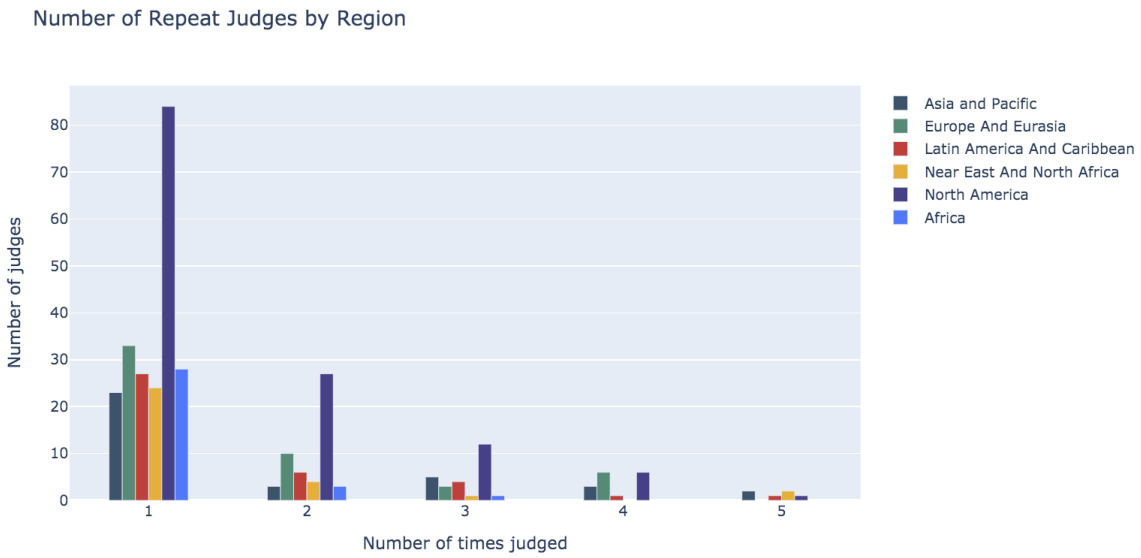


Figure 6: Bar chart showing the same data as Fig. 5 but broken down by GLOBE region.

One characteristic of the IVSS that makes it special is the reach across the world. The symposium is international and we see participants from across the globe. Since 2016, we have received projects from schools in 44 countries and our pool of judges is just as, if not more, diverse.

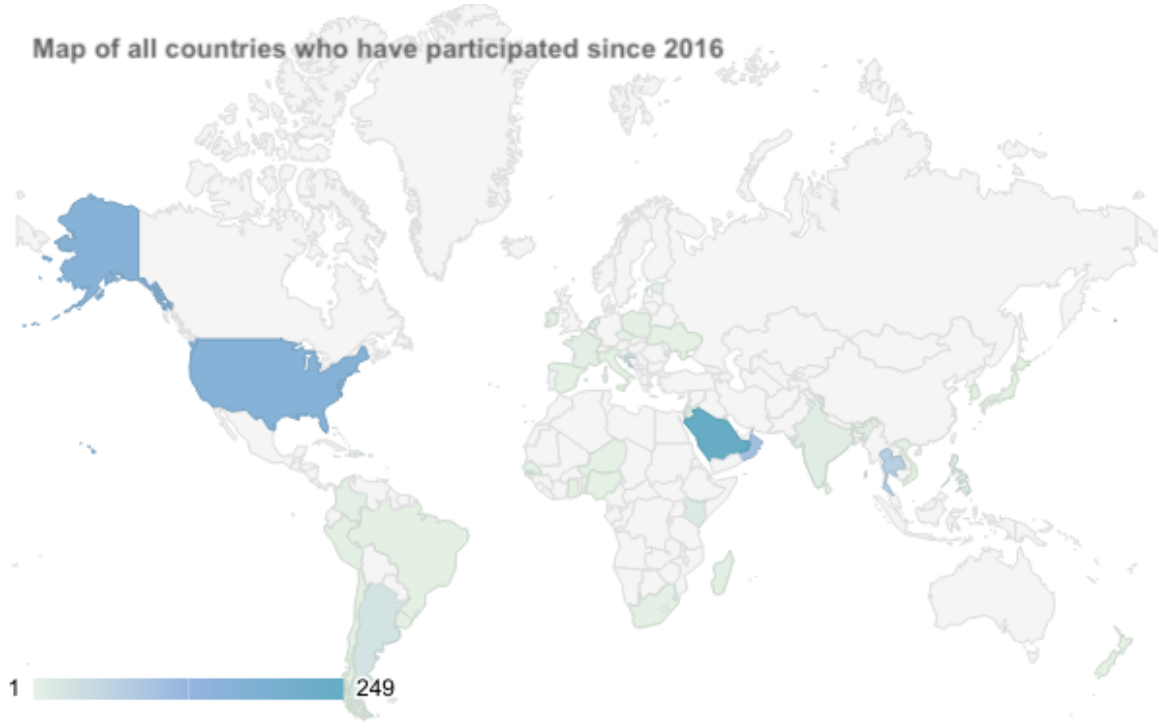


Figure 7: Heat map of all participating countries from 2016-2020. The intensity of the color shows the total number of projects submitted by the country over the past 5 years. There are 44 countries in all 6 GLOBE regions who have participated in one or more IVSS since 2016.

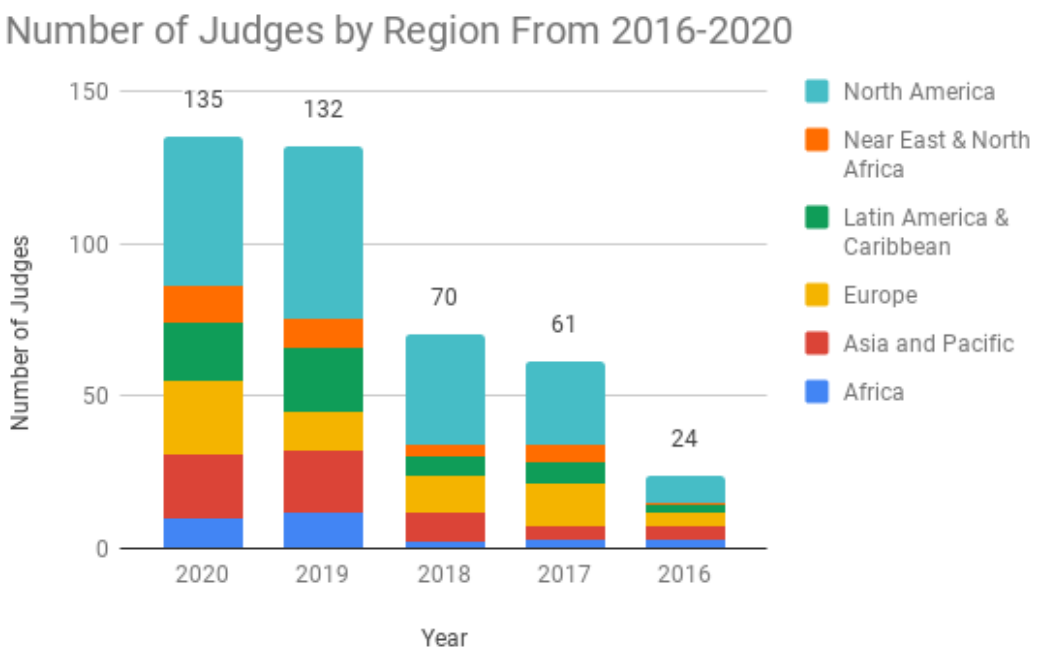


Figure 8: The number of participating volunteer judges has continued to grow from 2016-2020. This Bar graph shows the total number of judges by GLOBE region from 2016-2020.

The diversity of the participants is also reflected in the diversity of project topics. Students can choose to collect data using one or more protocols across 4 spheres: atmosphere, biosphere, hydrosphere, and pedosphere.

The four GLOBE spheres and Earth as a System. GLOBE has protocols and Learning Activities for students of all ages in these Earth science areas.

Until 2020, projects were only accepted in English, however last year we allowed students to submit projects in 4 additional langauges: Arabic, Spanish, French, and Croatian.

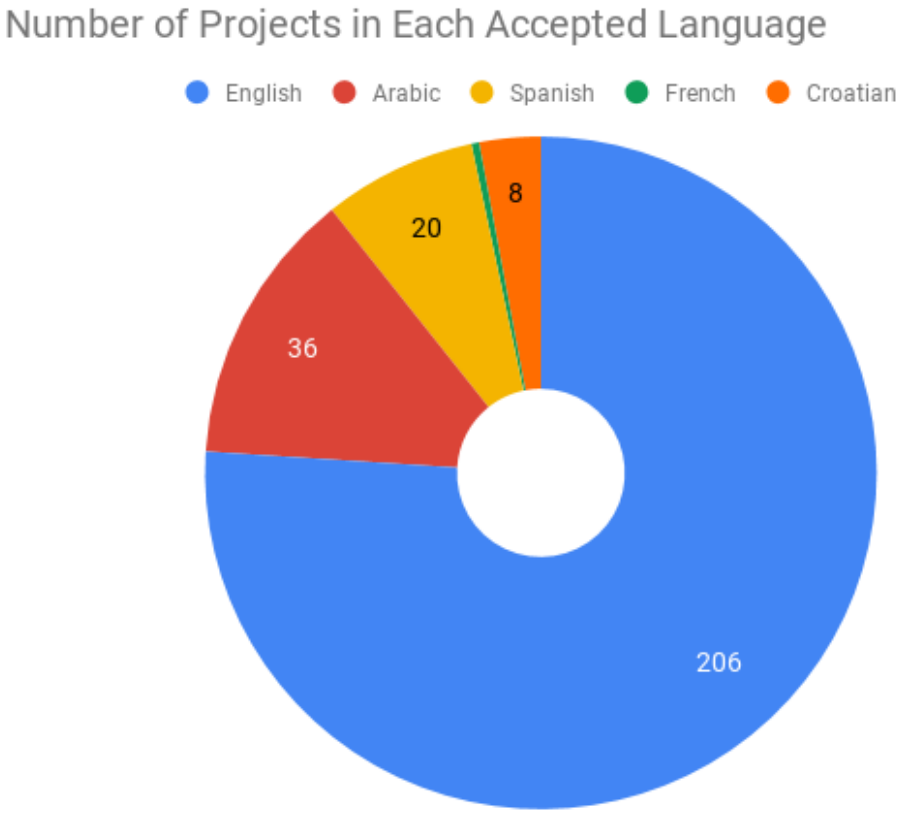


Figure 9: Of the 271 projects submitted in 2020, the majority of projects were written in English, but there were also projects submitted in Arabic, Spanish, French, and Croatian.

The growth of the IVSS has steadily increased over the past five years, as seen in increased participation by students and judges. However we have also seen an increase in quality. In 2019, there were 45 projects that qualified for entry into the drawing for stipends (earned a score of 4 stars and at least 2 optional badges). In 2020 that number jumped to 76! We are also seeing fewer projects that have earned 0 stars each year (0 star projects are usually missing key elements that are required for the IVSS, such as GLOBE data).

Thanks to a growing team of education and outreach experts that are working behind the scenes creating resources, recruiting judges, hosting webinars, orgainizing and scoring projects, and promoting the IVSS, we are able to see the IVSS continue to grow and improve. The 2021 IVSS is already shaping up to be another bigger and better year with staffers already hard at work preparing for the submissions to start trickling in starting in January 2021. In fact, we have already experienced the highest webpage and webinar views since 2016.

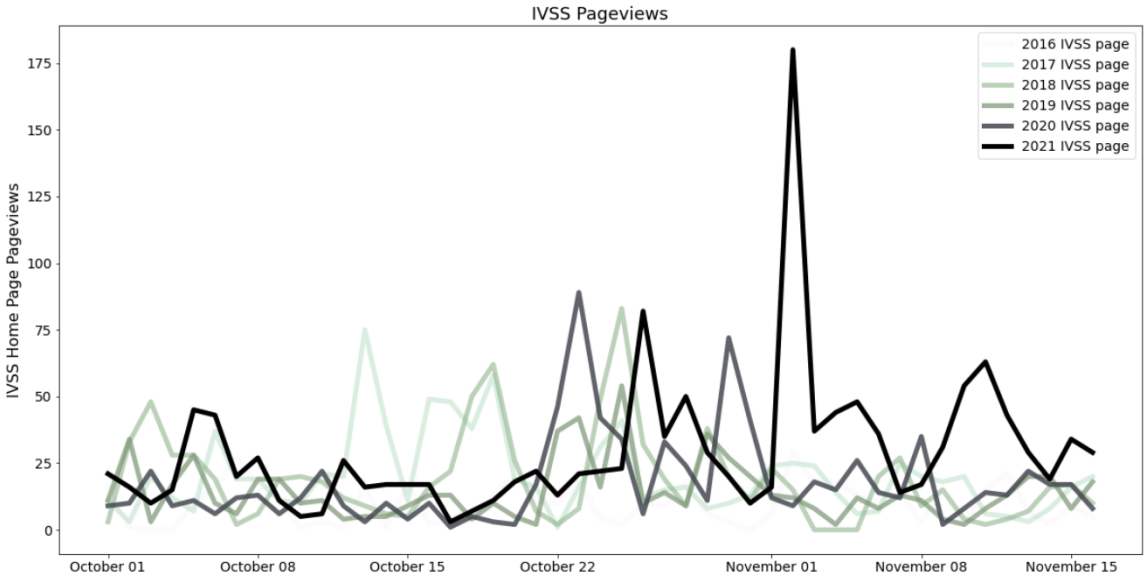


Figure 10: October and November views of the IVSS homapage (www.globe.gov/science-symposium) from 2016-2021 (year corresponds to the IVSS year, not calendar year). (Figure provided by Ksenia Lepikhina)

WHAT IS THE IVSS?

Long before COVID-19 forced teachers and students indoors and into the world of virtual education, the International Virtual Science Symposium (IVSS) has been a platform for students to showcase their research completely online.

The IVSS is a way for primary through undergraduate students from all GLOBE countries to showcase their research and hard work. Students are tasked with creating a complete research project - from asking question about their local or global environment, forming hypotheses, collectiong data, analyzing results, and drawing conclusions. They present their hard work with written reports and visual prestentations, such as a poster or narrated powerpoint video. During their project, they are encouraged to seek support from a STEM mentor or to collaborate with other students from their school or from other schools around the globe. As well, they may earn virtual badges by pursuing additional science skills such as data analysis, engineering solutions, storytelling, collaboration, and showcasing community impacts.

Two of the additional virtual badges students can earn on their IVSS projects.

Once the student project is complete, teachers will upload their student's report and visual aid through www.globe.gov (http://www.globe.gov) to be scored. Scoring is done by international volunteers consisting of STEM (science, technology, engineering, and math) professionals, GLOBE alumni, teachers, graduate students, and other interested community members. The students may earn between 0-4 stars depending on the quality of their reports and the judges are asked to provide the students constructive feedback which will help them grow as scientists.

Feedback from a GLOBE International STEM Network (GISN) member who volunteered as an IVSS judge.

In addition to receiving valuable feedback, students also are awarded virtual badges on their school's MyPage accounts on globe.gov. All participating students will get a Student Research Badge with the number of stars they earned. As well, if students have applied for and demonstrated the additional science skills mentioned above, they can earn up to three additional badges. Students who were given a score (averaged) of 4 stars and have earned at least 2 optional badges are entered into a drawing to receive stipends and an invitation to the Student Experience at the GLOBE Annual Meeting.

Every project will receive the "I am a student researcher" virtual badge on their school's globe.gov MyPage.

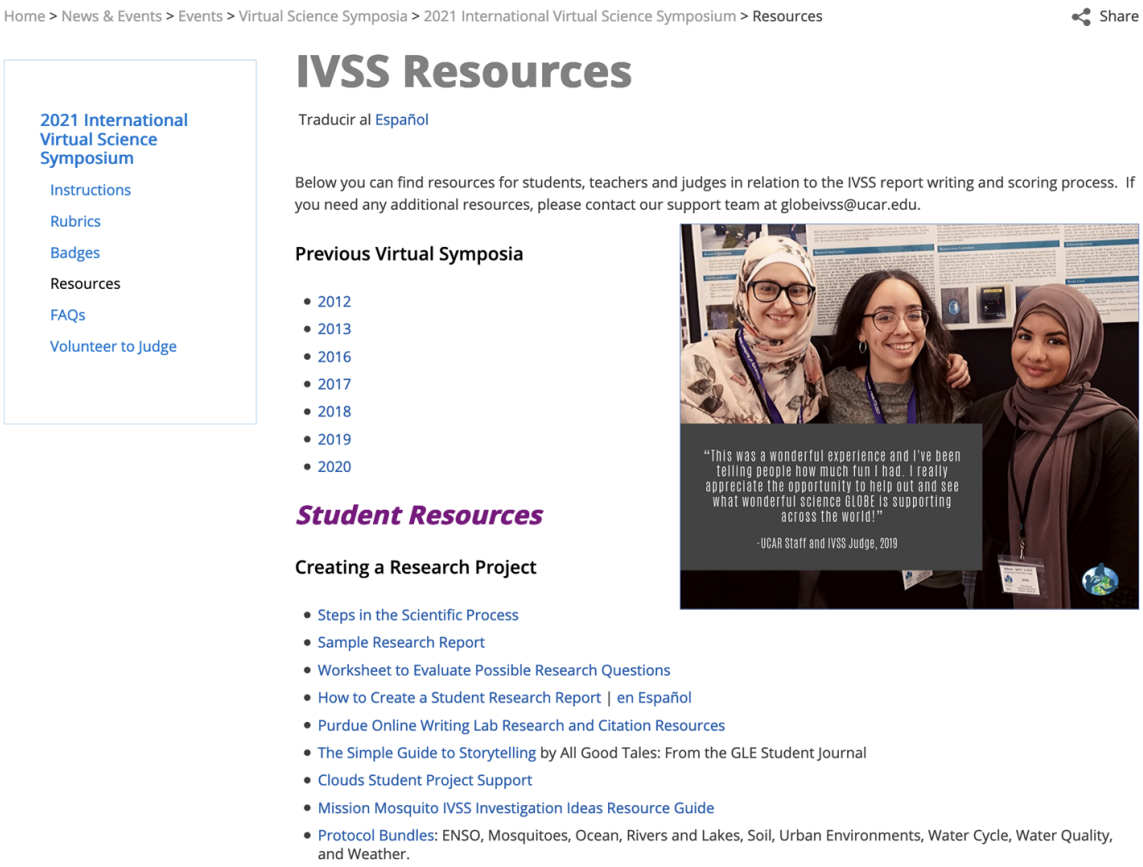
Pictured: Students and guides pose in front of the Howell Nature Center in Howell, Michigan, USA. Howell Nature Center was the site of the two-day Student Experience at the 2019 GLOBE Annual Meeting.

For all things IVSS, please visit www.globe.gov/science-symposium (http://www.globe.gov/science-symposium)!

INTERNATIONAL VIRTUAL SCIENCE SYMPOSIUM RESOURCES

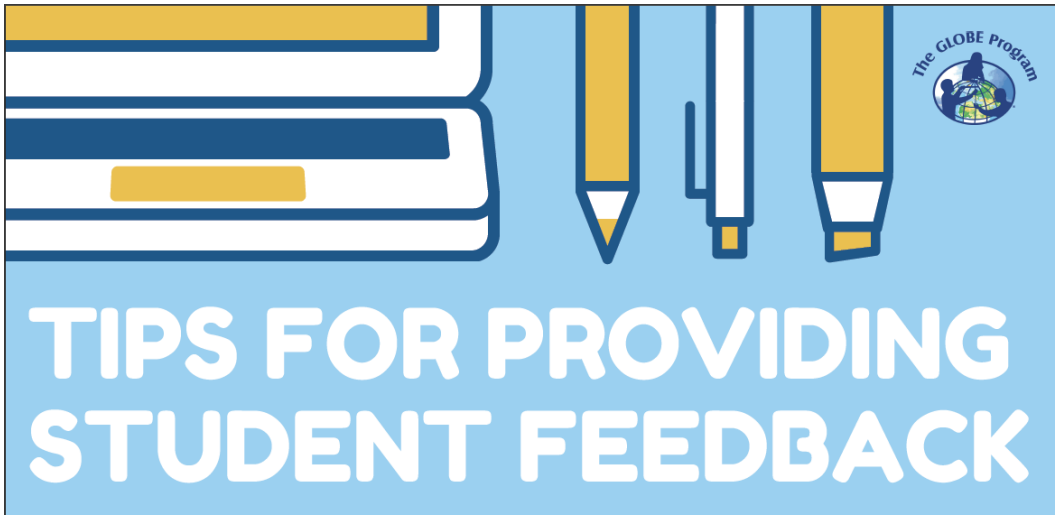
Besides for data collection, all aspects of the IVSS are virtual! Before virtual education became a necessity due to health risks associated with the ongoing pandemic, the symposium was made to be a virtual event to allow global particpation. Any student and teacher from a GLOBE country is encouraged to participate and judges can come from anywhere around the world without having to leave their computer.

Additionally, GLOBE provides a number of resources for students, teachers, and judges. All of these resources are available online and free to GLOBE members. In addition to downloadable document resources. New webinars are recorded each year and old webinars are archived and available on YouTube. This gives participants an option to interact face-to-face with the IVSS organizers and guest speakers and to ask questions in-person.



Screenshot of the 2021 IVSS Resources page (https://www.globe.gov/news-events/globe-events/virtual-conferences/2021-international-virtual-science-symposium/resources) (https://www.globe.gov/news-events/globe-events/virtual-conferences/2021-international-virtual-science-symposium/resources)

Resources include access to previous years' webpages and student projects, documents and webinars with tips for creating a research project and presentation, report and poster templates, and data resources. As well, there are also resources for teachers and judges. One document created last year for judges proved to be particularly helpful in suggesting areas for judges to focus on when providing feedback for the students. Anecdotally, we saw an increase in the amount of feedback given as well as a marked increase in feedback quality.



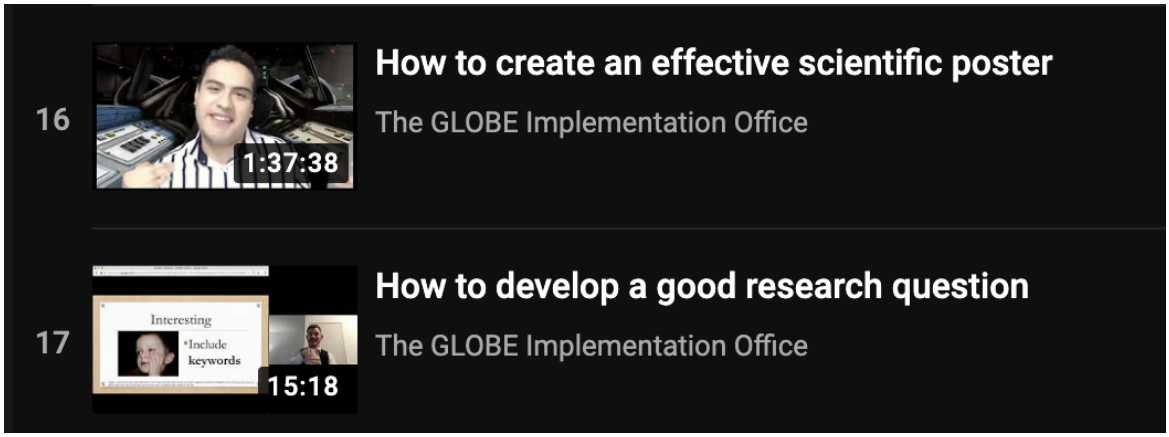
This helpful document can be accessed on the IVSS Resources page.

Moreso, this year (IVSS 2021), in an effort to expand on the growing list of resources we provide to students, teachers, and judges, we have recorded five additional webinars. The first two focus on data science and are discussed in more detail in the "Adapting to COVID-19" section. Another one focused on tying student research to GLOBE's ongoing data collection campaigns, such as "Mission Mosquito," a campaing to collect data on mosquito habitats using the GLOBE Observer app (https://observer.globe.gov/ (https://observer.globe.gov/)). The other two were aimed at increasing our reach to a more diverse community and were dual language.

The first was a dual language (English and Spanish) webinar presented by Alejandro Mundo who is a CCRI Educator / Associate Researcher at NASA Goddard Institute for Space Studies on creating a scientific poster.

The second dual language webinar was presented in American Sign Language and English by Wade Phillips (ASL) and Jillian Anderson (English), both high school science teachers at Lexington School for the Deaf in NY. This webinar focused on how to develop a good research question.

While both of these webinars were created for the 2021 IVSS, these will be useful tools that cater to a linguistically diverse audience for years, and IVSS's to come.



Screenshot of the two bilingual webinars on YouTube.

Find these videos and more IVSS videos and webinars at:

The GLOBE Implementation Office (https://www.youtube.com/c/TheGLOBEImplementationOfficeGIO?fs=1&modestbranding=1&rel=0&showinfo=0)

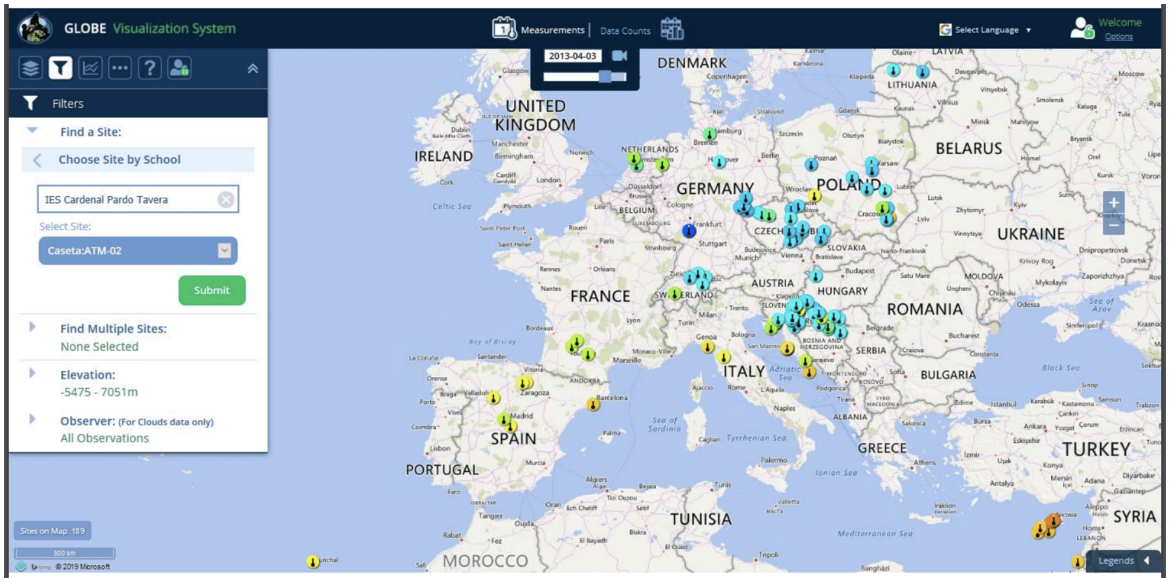
We know that these videos are reaching our audiences as well. As of 11/19/2020 we have already had quite a few views on our 2021 IVSS webinars and it is still early!

Webinar	**Views (as of 11/19/20)**	**Language(s)**
2021 International Virtual Science Symposium General Informational Overview Webinar	94 Views	English
Data Science Intro and Q&A with Ksenia	61 Views	English
Mapping your GLOBE data with ESRI ArcGIS and Creating Story Maps	54 Views	English
How to create an effective scientific poster	1037 Views	English, Spanish
How to develop a good research question	32 Views	English, American Sign Language

Table of 2021 IVSS webinar views pulled from YouTube. (Figure provided by Ksenia Lepikhina)

ADAPTING TO COVID-19

For the most part, the 2021 IVSS should look the same as it has in previous years. Since the event already takes place virtually, the process of submitting reports and having volunteer judges score the reports will continue business-as-usual. However, there is one feature of the IVSS that is adapting to the current situation. In previous years, we required students to submit data to the GLOBE database as part of their project. For the 2021 IVSS, we are waiving this requirement. Students may use archived data from the GLOBE database if local rules or regulations concerning the pandemic restrict any data collection.

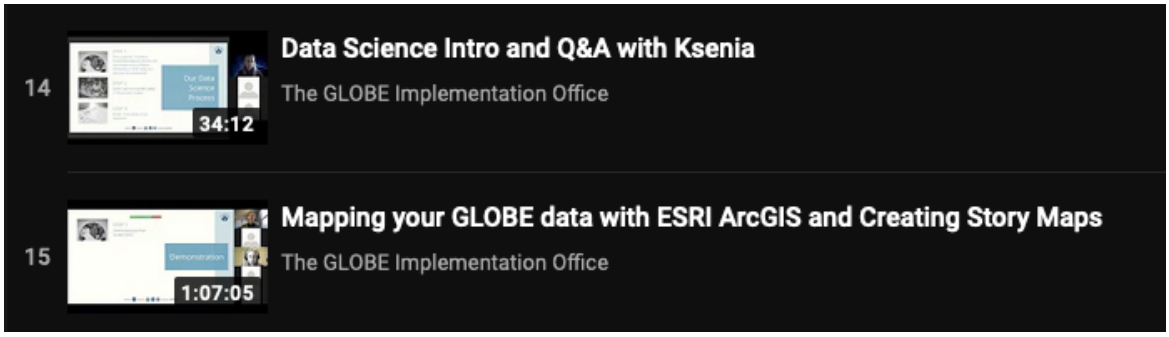


Screenshot of the GLOBE visualization system.

As well, this year we will be focusing on **Data Analysis**. Students can use new or old data for their projects but are encouraged to scrutinize their data through the lens of a data analyst. This could mean creating more data visuals or doing more in-depth analysis of the data they have collected. We are also encouraging our GLOBE International STEM Network (GISN) members to get involved by mentoring students and providing useful data analysis tips to students. Either way, we hope that students can grow their skills in this field.

The "I am a data scientist" virtul badge students may earn on their projects.

In order to help students with this focus, we hosted two webinars in October 2020 focusing on data science. The first was an Intro to Data Science from GIO Data Analysist Ksenia Lepikhina, where she went over some basic data science skills and answered questions from viewers. The second webinar was on the use of ESRI ArcGIS software to create data maps and story maps hosted by GIO staffer Emma Hagen and NASA staffer Desiray Wilson. Link for both of these webinars can be found on www.globe.gov/science-symposium as well as on The GLOBE Implementation Office YouTube channel (https://www.youtube.com/c/TheGLOBEImplementationOfficeGIO?fs=1&modestbranding=1&rel=0&showinfo=0).



Screenshot of the data science webinars on YouTube.

2021 International Virtual Science Symposium Timeline/Important Dates:

- **IVSS Informational Webinar** - 7 October 2020
  - *Webinar recording:* https://youtu.be/g7w8aWuCEro (https://youtu.be/g7w8aWuCEro)
- **GLOBE Data Science Intro and Q&A with Ksenia** - 14 October 2020
  - *Webinar recording:* https://youtu.be/gE2NxATYZXY (https://youtu.be/gE2NxATYZXY)
- **Mapping your GLOBE data with ESRI ArcGIS with Emma and Desiray**- 28 October 2020
  - *Webinar recording:* https://youtu.be/yuwcOD5_Vdg (https://youtu.be/yuwcOD5_Vdg)
- **"How to create an effective scientific poster"** (Dual Language - English/Spanish) with Alejandro Mundo (CCRI Educator / Associate Researcher, NASA Goddard Institute for Space Studies) - 11 November 2020
  - *Webinar recording:* https://youtu.be/o5XLmlFBOlI (https://youtu.be/o5XLmlFBOlI)
- **"How to develop a good research question"** (Dual Language - English/ASL) with Jillian Anderson and Wade

Phillips (High School Science Teachers, Lexington School for the Deaf) - 18 November 2020
- *Webinar recording:* https://youtu.be/w_YPgb-cT1M (https://youtu.be/w_YPgb-cT1M)

- **Reports Accepted** - Mid to late January - 10 March 2021
- **Due Date for all student reports** - 10 March 2021
- **Judging Webinar** - 29 March 2021 (9:00 am MT)
- **Judging Period** - 29 March - 5 April 2021
- **Feedback and Virtual Badges Shared** - 22 April 2021
- **Drawing for Stipends** - 22 April 2021

For this timeline and other IVSS information, please visit globe.gov/science-symposium (http://globe.gov/science-symposium).

For questions regarding the IVSS, please email: **globeivss@ucar.edu**

ABSTRACT

For the past five+ years, The GLOBE Program has hosted an International Virtual Science Symposium (IVSS). This annual event invites primary through undergraduate GLOBE (Global Learning and Opportunities to Benefit the Environment) students to showcase their Earth science research in an entirely online platform. With GLOBE, students learn the practices of science through hands-on investigations in their own communities, sparking their curiosity and interest in science. This often leads to inquiries that help solve real-world problems and further understanding of our global environment. Students from around the world submit their research projects to a panel of international scientists, teachers, subject matter experts, graduate students, and other interested community members for scoring and valuable feedback which will help them improve as scientists. As well, students are awarded digital badges if they demonstrate specific scientific practices such as collaboration, data science, and engineering. Badges are also awarded to students who work with STEM professionals, explore STEM careers, demonstrate community impacts, and share their research in creative ways such as through storytelling. By the time the pandemic started shutting down schools across the world, the 2020 IVSS was already underway and was able to continue with few interruptions. This helped to reinforce the IVSS as a model for virtual student engagement on a global scale. As well, we now have five years of data to help assess the efficacy of the IVSS, analyze its growth, and help direct future engagement opportunities. Planning for the 2021 IVSS is already underway and we are currently working on how to incorporate COVID-19-related restrictions into the model by encouraging a focus on using previously collected GLOBE data and creating student resources aimed at improving data science skills.